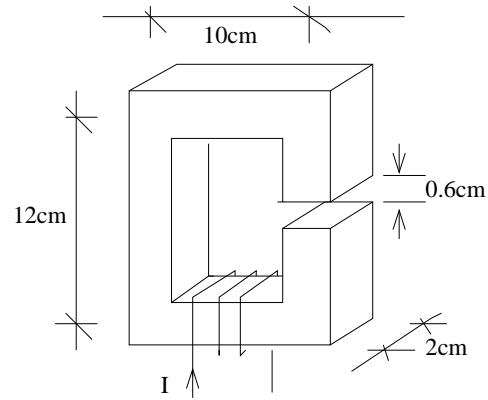


1. Consider a magnetic circuit shown in the following picture.



The current  $I$  is 10A, the coil has 2000 turns, all branches have the same cross-sectional area of  $2\text{cm}^2$  and the core is iron  $\mu_r$  of which is 1500. Find the reluctance  $\mathcal{R}$ , the magnetomotive force  $\mathcal{F}$  and the magnetic flux  $\Psi$ , firstly for the core and then again for the air gap.

- 2.** In a cube of size  $a$ , assuming  $k_0$  constant, suppose we know the following holds.

$$\mathbf{M} = \frac{k_0}{a}(-y\mathbf{a}_x + x\mathbf{a}_y).$$

Find the magnetisation volume current density  $\mathbf{J}_b$ .

3. Consider a material  $\mu$  of which is  $6.5\mu_0$ . Suppose the magnetic fields is  $\mathbf{H} = 10\mathbf{a}_x + 25\mathbf{a}_y - 40\mathbf{a}_z \text{ A} \cdot \text{m}^{-1}$ . Find the magnetic susceptibility  $\chi_m$  of this material, the magnetic flux density  $\mathbf{B}$ , the magnetization  $\mathbf{M}$ , and the magnetic energy density  $w_m$ .